EPA Region 7 TMDL Review

TMDL ID: KS-MO-01-204_32 **State:** KS
Document Name: INDIAN CREEK

Basin(s): LOWER MISSOURI - CROOKED
HUC(s): 10300101
Water body(ies): INDIAN CREEK
Tributary(ies): TOMAHAWK CREEK KS-MO-01-204_53
Pollutant(s): NITRATE

Submittal Date: 9/5/2007 **Approved:** Yes

Submittal Letter

State submittal letter indicates final Total Maximum Daily Load(s) (TMDL) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act [40 CFR § 130.7(c)(1)]. Include date submitted letter was received by EPA, date of receipt of any revisions, and the date of original approval if submittal is a phase II TMDL.

The United States Environmental Protection Agency, Region 7 (EPA) received Indian Creek's TMDL submittal letter on 09/05/2007 from the Kansas Department of Health and Environment (KDHE). KDHE emailed revisions to EPA on 10/26/2007.

Water Quality Standards Attainment

The water body's loading capacity (LC) for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards (WQS) [40 CFR § 130.7(c)(1)]. A statement that WQS will be attained is made.

This Indian Creek TMDL addresses the listed pollutant, nitrate, directly.

Sampling discussed in the TMDL reveals that nitrate sources are wastewater effluent indicated by elevated concentrations of ammonia, nitrate and ortho-phosphate found below the point where the watershed's two wastewater plants release into Indian Creek. Above the wastewater plants, nitrate levels in the creek are not elevated. Other sampling further demonstrates this cause and effect relationship between wastewater and increased nitrate. Sampling during runoff events shows nitrates are not as highly concentrated in stormwater.

Finally, grab samples taken at low flows confirm the dominant influence of wastewater with higher concentrations of the pollutant. Data in the TMDL indicate that there are no nitrate exceedances above 10 mg/l once flow rises above 45 cubic feet per second (cfs). The TMDL states that excessive nitrate concentrations are prevalent in Indian Creek during low flows and directly results from wastewater discharges.

The LC is determined through the use of a load duration curve in this TMDL. At 50% flow, the LC for nitrate in this TMDL is 2,445 lbs/day. The load duration curve correlates the targeted nitrate concentration to the amount of flow in the water body resulting in a total loading capacity which will meet WQS at any amount of flow. However, nitrate loading from wastewater sources of concern are directly addressed by holding these wastewater sources steady at 1,642 lbs/day over the load duration curve's range of flows.

The EPA agrees that the TMDL's LC will attain WQS.

Numeric Target(s)

Submittal describes applicable WQS, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

Applicable WQS, designated uses and numeric targets are stated in this TMDL specific to Indian Creek, along with their citation from administrative records.

The designated uses of this segment (Indian Creek, KS-MO-01-204_32) are expected aquatic life support, primary B contact recreation, domestic water supply, food procurement, ground water recharge, industrial water supply use, irrigation use, livestock watering use. The impaired uses are expected aquatic life and potentially attainable domestic water supply.

The WQS that apply directly to the impaired uses are numeric for the drinking water standard and narrative for the expected aquatic life standard, as described below:

Narrative: KAR 28-16-28(c)(2)(A): "The introductions of plant nutrients into streams, lakes, or wetland from artificial sources shall be controlled to prevent the accelerated succession or replacement of aquatic biota or the production of undesirable quantities or kinds of aquatic life."

Numeric: KAR 28-16-28e(c)(3)(A): Nitrate as Nitrogen: 10 mg/l, "...the criteria listed in table 1a, as adopted in subsection (d) of this regulation, for domestic water supply use shall not be exceeded at any point of domestic water supply diversion."

This TMDL applies the afore mentioned domestic water supply criterion of 10 mg/l nitrate as nitrogen as a numeric translator for the narrative criterion. EPA agrees that this numeric target is protective of the narrative standard.

EPA agrees that further monitoring, as outlined in the TMDL, will result in a refinement of the TMDL, if the water body remains impaired.

Pollutant(s) of concern

An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety (MOS) that do not exceed the LC. If submittal is a phase II TMDL there are refined relationships linking the load to WQS attainment. If there is an increase in the TMDL there is a refined relationship specified to validate the increase in TMDL (either load allocation (LA) or waste load allocation (WLA)). This section will compare and validate the change in targeted load between the versions.

The link for nitrate to the impairment is direct. The numeric target of 10 mg/l nitrate as nitrogen is set to directly address the pollutant causing the impairment (nitrate). The translation of the narrative criterion is linked to the domestic drinking water standard for nitrate nitrogen.

The short term end point for the TMDL is to reduce nitrate levels below 10 mg/l and to fully support an attainable domestic water supply use on Indian Creek in the future.

The long term end point is to reduce the total nitrogen loads below the criterion in accordance with the Kansas Surface Water Nutrient Reduction Plan through installation of Biological Nutrient Removal (BNR) technology. BNR is a modification of traditional biological treatment processes utilized by the majority of large wastewater treatment plants in Kansas that targets 8 mg/l total nitrogen in effluent.

Source Analysis

Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, nonpoint and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered. If this is a phase II TMDL any new sources or removed sources will be specified and explained.

There are eight National Pollution Discharge Elimination System (NPDES) permitted facilities discharging in the watershed. Six of the facilities are Municipal Separate Storm Sewer Systems (MS4s): Olathe (KSR041025, M-KS52-SU01, expires September 30, 2009); Overland Park (KSR041026, M-MO28-SU01, expires September 30, 2009); Leawood (KSR041015, M-MO27-SU01, expires September 30, 2009); Lenexa (KSR041016, MKS34-SU01, expires September 30, 2009); Prairie Village (KSR041028, M-MO38-SU01, expires September 30, 2009); and Johnson County (KSR041007, M-KS52-SU02, expires September 30, 2009). Two of the discharging facilities are Indian Creek Middle Basin MWTP (KS0119601, M-MO28-OO01) and Tomahawk Creek MSD No.1 MWTP (KS0055484, M-MO27-OO01). There is also one non-discharging facility: Clarkson Construction (KSG110162, I-MO28-PR01).

Nonpoint sources included in the submittal are land use and on-site waste systems. Land use is mostly residential, commercial and industrial (76-78%). Most of the agricultural use (5-9%) is located in the headwaters of Tomahawk Creek. Green space is 5-9% of land use. Most of the on-site waste system density (1.1 systems/sq mile) is tied into sanitary sewers.

The TMDL includes a discussion of contributing run-off conditions. Average permeability is 0.8 inches/hour and runoff is mainly from infiltration excess when rainfall is greater than permeability. The TMDL quantifies runoff at 100% of the watershed even under relatively low rainfall conditions. Background levels of nitrate are lower in the upper part of the watershed where land is mostly developed. Higher concentrations are seen in the lower part of the watershed which is influenced by agricultural activities. The agricultural land along the lower part of the watershed may contribute to the cause for the higher system density (13.8 systems/sq mile) in that area. Nonetheless, levels below 0.5 mg/l nitrate in the summer and 2 mg/l nitrate in the winter are expected, as long as there is no influence from wastewater plants.

EPA agrees that all known sources are identified and discussed.

Allocation - Loading Capacity

Submittal identifies appropriate WLA for point, and load allocations for nonpoint sources. If no point sources are present the WLA is stated as zero. If no nonpoint sources are present, the LA is stated as zero [40 CFR § 130.2 (i)]. If this is a phase II TMDL the change in LC will be documented in this section.

The data indicate that the excessive nitrate concentrations are prevalent as a low flow problem and directly result from wastewater discharges. The nature of the nitrate exceedances tend to be predominantly low flow events, where municipal wastewater has a predominant influence, places the emphasis of this TMDL and its allocations on controls of point sources through WLAs -- this is a critical flow condition under which WLA reductions will be targeted.

The following table gives daily loading information in pounds per day (lbs/day) of nitrate. Permit numbers for WLA facilities given in Source Analysis Section.

Flow	Middle Basin WLA	Tomahawk Creek WLA	MS4 WLA	LA	MOS	TMDL
90%	968	674	0	0	410	2,052
75%	968	674	66	8	410	2,126
50%	968	674	348	45	410	2,445
25%	968	674	1,298	169	410	3,519
10%	968	674	5,085	661	410	7,798

WLA Comment

Submittal lists individual WLAs for each identified point source [40 CFR § 130.2(h)]. If a WLA is not assigned it must be shown that the discharge does not cause or contribute to WQS excursions, the source is contained in a general permit addressed by the TMDL, or extenuating circumstances exist which prevent assignment of individual WLAs. Any such exceptions must be explained to a satisfactory degree. If a WLA of zero is assigned to any facility it must be stated as such [40 CFR § 130.2(i)]. If this is a phase II TMDL any differences in phase I and phase II WLAs will be documented in this section.

Two wastewater facilities and the MS4s are identified as the major point source contributors to LC. The 1,990 lbs/day WLA at 50% flow is distributed as follows: 968 lbs/day for the Middle Basin Plant, 674 lbs/day for the

Tomahawk Creek Plant, and 348 lbs/day for the MS4s. Stormwater wasteloads do not make up much of the TMDL until flow conditions exceed median flow, at which point MS4s are 14% of the TMDL. The proportion allocated for MS4s increases as flow increases as defined through a load duration curve.

LA Comment

Includes all nonpoint sources loads, natural background, and potential for future growth. If no nonpoint sources are identified the LA must be given as zero [40 CFR § 130.2(g)]. If this is a phase II TMDL any differences in phase I and phase II LAs will be documented in this section.

Nonpoint sources are not a significant contributor and background levels are well below the nitrate criterion. Typical nonpoint sources are displaced by urban-oriented runoff activities and the LA values listed in TMDL are the difference between the MS4s' WLA allocation and the MOS allocation. Therefore, the LA from the 11.5% of undeveloped and agricultural land in the watershed is 45 lbs/day at the median flow of 50%. The LA proportion of the TMDL increases as flow increases and is expressed as a load duration curve in the TMDL.

Margin of Safety

Submittal describes explicit and/or implicit MOS for each pollutant [40 CFR § 130.7(c)(1)]. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided. If this is a phase II TMDL any differences in MOS will be documented in this section.

The MOS is explicit. MOS is computed as the load resulting from the current flow in Indian Creek and 2 mg/l nitrate. At 50% flow, the resulting MOS is 410 lbs/day, which is immediately below the total load duration curve of the TMDL. There is an additional implicit MOS since no surface water diversions for domestic water supply exist along Indian Creek.

Seasonal Variation and Critical Conditions

Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s) [40 CFR § 130.7(c)(1)]. Critical conditions are factors such as flow or temperature which may lead to the excursion of WQS. If this is a phase II TMDL any differences in conditions will be documented in this section.

Seasonal variation is accounted for in the use of the TMDL's load duration curve. The LC is set based on hydrology which follows seasonal patterns. The nature of the nitrate exceedances which tend to be predominantly low flow events sets a critical period for excursions at low flow. In this TMDL the WLA and LA are delineated as the product of flow and the nitrate water quality criterion of 10 mg/l over the range of flows.

Public Participation

Submittal describes required public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s) [40 CFR § 130.7(c)(1)(ii)].

A public hearing was held in Overland Park, KS, in City Hall on July 11, 2007. The Kansas-Lower Republican Basin Advisory Committee held meetings to discuss this TMDL on March 6, May 16 and July 17, 2007. In 2007, the draft TMDL was published on KDHE's internet site from June to August in order to share the TMDL with the public and give additional opportunity for comment. Correspondence was exchanged with Johnson County Wastewater regarding the applicability of the nitrate criterion on Indian Creek where no surface water points of diversion exist. The TMDL addressed the comment. Copies of comments and KDHE's responses were included in the submission.

Monitoring Plan for TMDL(s) Under Phased Approach

The TMDL identifies a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used) [40 CFR § 130.7].

KDHE will collect bimonthly samples over 2008-2013 at monitoring Station 204 to assess impairment. Status of impairment will be re-evaluated in 2012 and 2014. If impairment continues, sampling will continue until 2016 to assess impairment after any upgrades at the Tomahawk Creek facility.

Reasonable Assurance

Reasonable assurance only applies when less stringent WLAs are assigned based on the assumption of nonpoint source reductions in the LA will be met [40 CFR § 130.2(i)]. This section can also contain statements made by the state concerning the state's authority to control pollutant loads.

No reasonable assurances apply because all permitted end point sources have sufficient WLAs assigned. However, additional reasonable assurances were included in the TMDL and are detailed in the below paragraph.

The following state authorities may be used to control pollutant loads in the watershed: KSA 65-164and 165, KSA 65-171d, KAR 28-16-69 to -71, KSA 2-1915, KSA 75-5657, KSA 82a-901, et seq., KSA 82a-951, the Kansas Water Plan and the Missouri Water Plan.

Other reasonable assurances are provided in the TMDL for reduction in LA:

- the State Revolving Loan Fund operated through KDHE by providing low interest loans for wastewater treatment improvement, and
- the nonpoint Source Pollution Control Fund of the State Conservation Commission which distributes $2.8 million annually for nonpoint source abatement practices.